

WHAT IS CLAIMED IS:

1. A method for measuring a position of a liquid surface of a melt, comprising the steps of:

- 5       measuring an image of a fusion ring existing in a boundary between a single crystal pulled by a Czochralski method and a melt to detect a central position of the single crystal based on the image, wherein two measuring lines are set in the image of the fusion ring, and the  
10       intersections of the respective measuring lines and the fusion ring defined on opposite sides of the fusion ring are detected, and the central position of the single crystal is calculated based on intervals between the intersections defined on the opposite sides of the fusion  
15       ring; and  
          determining the position of the liquid surface of the melt based on the detected result.

20       2. The method for measuring the position of the liquid surface of the melt according to Claim 1, wherein the measuring lines are set based on a central position of a seed crystal taken in a necking process.

25       3. The method for measuring the position of the liquid surface of the melt according to Claim 1, wherein thresholds for use in the detection of the intersections of the measuring lines and the fusion ring defined on the opposite sides of the fusion ring are dynamically set

based on an average of a peak luminance of the fusion ring in such a manner that the thresholds of the intersections on the right and left hand sides in the image thereof are independent of each other.

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4. The method for measuring the position of the liquid surface of a melt according to Claim 1, wherein at least two sets each comprising a combination of two measuring lines are defined, and an average of the  
10 central positions of the single crystal corresponding to the respective combinations is taken as a measured value of the central position of the single crystal.

5. The method for measuring the position of the  
15 liquid surface of the melt according to Claim 1, wherein an image-measuring cycle and a time-period for averaging are determined based on a rotational speed of a single crystal rotated while the single crystal is being pulled, and calculation results of the central position of the  
20 single crystal, obtained during the time-period for averaging, are averaged.

6. A device for measuring a position of a liquid surface of a melt, with which an image of a fusion ring  
25 existing in a boundary between a single crystal pulled by a Czochralski method and the melt is measured, a central position of the single crystal is detected based on the image, and the position of the liquid surface of the melt

is determined based on the detected result, the device comprising:

means for setting two measuring lines in the image of the fusion ring;

5 means for detecting the intersections of the respective measuring lines and the fusion ring, the intersections are on the opposite sides of the fusion ring; and

means for calculating the central position of the  
10 single crystal based on the intervals between the intersections on the opposite sides of the fusion ring.

7. The device for measuring the position of the liquid surface of the melt according to Claim 6, wherein  
15 the means for setting measuring lines sets measuring lines based on the central position of a seed crystal in a necking process.

8. The device for measuring the position of the  
20 liquid surface of the melt according to Claim 6, wherein the means for detecting intersections dynamically sets thresholds for use in the detection of the intersections of the measuring lines and the fusion ring defined on the opposite sides of the fusion ring, based on the average  
25 of a peak luminance of the fusion ring in such a manner that the thresholds of the intersections on right and left hand sides are independent of each other.

9. The device for measuring the position of the liquid surface of the melt according to Claim 6, wherein the means for setting measuring lines defines at least two sets each comprising a combination of two measuring  
5 lines, the means for detecting intersections detects all of the intersections of the measuring lines, and the means for calculating the central position takes, as a measured value of the central position of the single crystal, an average of the calculated results of the  
10 central position of the single crystal corresponding to the respective combinations of measuring lines.

10. The device for measuring the position of the liquid surface of the melt according to Claim 6, wherein  
15 the means for calculating the central position determines an image measuring cycle and a time period for averaging based on a rotational speed of the single crystal rotated while the single crystal is being pulled, and averages the calculated results of the central position of the  
20 single crystal obtained during the time period for averaging.